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investigations along exactly the lines printed in the Bulletin, with many others, but to have him do so in conjunction with simultaneous field studies * * * etc.

To one who is unacquainted with either party to the controversy, on the nature of which he is also very little posted, the following questions naturally arise:

1. By what uncharted route under the civil service did Dr. Buckingham reach his present position in the Department of Agriculture?

2. Does one who secures a position in the department by the means implied, consider himself owned by one outside of the department, so that the latter shall complain, 'Is the creature greater than the creator?'

3. Is Dr. Buckingham owned in Madison, Wisconsin?

ARTHUR JOHN HOPKINS.

October 22, 1905.

SPECIAL ARTICLES.

THE METHOD OF ELIMINATION IN FIXING GENERIC TYPES IN ZOOLOGICAL NOMENCLATURE.

ONE of the most perplexing problems in zoological nomenclature is to decide on the proper application of a generic name used in a comprehensive sense by an early author, to one of the component parts of the original group. The genus of Linnæus and his followers of the eighteenth century corresponds fairly to the family of the twentieth century. It is agreed that a generic name should stand or fall by its typical species. But the writers of the eighteenth century had little conception of type-species in the modern sense. We must, therefore, find some method of fixing their types for them.

This may be done by choosing the 'best known European or officinal species,' to quote an expression attributed to Linnæus. When such a species is clearly indicated, this ought to settle the matter. But it does not do so in all cases, as some genera have no species either European or officinal. As many of the earlier writers took Linnæan specific names for their genera (tautonomy), it is safe to regard such a practise as fixing the type in question. *Bodianus bodianus* is an example of this sort. Virtual tautonomy (as *Tetrao*

tetrix, *Scomber scombrus*) amounts to the same thing.

The method of beginning with a leading species or *chef de file*, as typical representative of each genus to be described in full, while the others were disposed of in comparative sentences, was adopted by Lacépède, Cuvier, Valenciennes, Poey and other authors. In ichthyology this has given reason for the choice of the type of the genus by page precedence. This method was raised to the dignity of a universal rule by Dr. Bleeker and others. It is a pity that it was not systematically adopted earlier, for it would have given fixity, a matter which in nomenclature far outweighs all others. But Linnæus, among others, usually placed his type-species in the middle of the series, the less known or more aberrant forms at either end of it.

The rule of the first reviser is generally recognized, and is given precedence over all other methods of fixing the type by many authors. The objection to it is that no one has yet defined the first reviser, so as to separate his rights from the rights of different meddlers. If we admit none to be revisers, unless they definitely limit a genus and definitely associate its name with some one or more of its original constituent species, to the exclusion of others, this rule may be available, although its application involves a good deal of otherwise profitless labor in bibliography.

In recent years a rule of fixing types by elimination has come into vogue, the American Ornithologists' Union having given it especial prominence. As a guide to the operations of a first reviser, who finds no type assigned by previous writers, the rule is not open to serious objection.

But it has been largely applied without regard to previous revisers, and the meanings of various generic names have been frequently shifted in accordance with its supposed demands. It is evident that it is in great need of definition.

For example, let *A*, *B*, *C*, *D* represent the species of a comprehensive genus called *X*. If each of these is successively made the type of a new genus *U*, *V*, *Y*, *Z*, then *Z*, the last

of these, is invalid and its type, *D*, becomes the proper type of *X*. This is the simple condition of the problem. But let *A* and *C* be set off to form a new genus; *C* and *D*, another. Let a new genus be formed which would probably include *B* in it. Let still another be framed which might possibly include *D*. Let it be further uncertain whether *A* and *B* should be placed in different groups. Let still another writer definitely connect the old genus with *A*, while another uses it, not for any of its constituents, but for some new form probably congeneric with *B*, and you have a not unusual statement of the problem.

There is no way out of this by the rule of elimination. By accepting the first reviser rule, itself subject to the Linnæan rule and the rule of tautonomy, we may well fall back on the rule of page precedence, and let the rule of elimination be simply a recommendation to the first reviser, without direct validity of its own. This is the position of the rule of elimination in the new International Code.

I give two concrete illustrations of the difficulties of the rule of elimination among genera of fishes.

The genus *Clupanodon* Lacépède, 1803, was based on 'toothless herrings,' the *chef de file* being *Clupanodon thrissa*. This species as described by Lacépède, is the *Clupea thrissa* of Broussonnet, the American species, later called *oglinus* by Le Sueur. This is, however, not the original *Clupea thrissa* of Linnæus, 1758, which was based on the *Clupea thrissa* of Osbeck, 1757, a Chinese species, later called *Clupea nasus* by Bloch, a species of *Konosirus*. The second species of Lacépède, *nasicus*, is the same as *Clupea nasus* of Bloch. The third, *pilchardus*, is the *Clupea pilchardus* of Linnæus, a species of *Sardinia*, which is probably the same as *Sardinella*. The fourth species of Lacépède, *sinensis*, is apparently the species called later *Clupea ilisha*, and is probably not the original *sinensis* of Linnæus. It is a species of *Clupeonia* or *Harengula*. The fifth, *africanus*, is a species of *Ilisha*, and the sixth, *jussieu*, is the original type of the genus *Clupeonia*.

Arranging these according to the modern genera:

1. *thrissa*. The type of *Thrissa* Rafinesque, 1815, the name given as a substitute for the hybrid name *Clupanodon*.

Chatoëssus Cuvier, 1817, based on Lacépède's *thrissa*, the generic name later transferred by Valenciennes to *punctatus*, the *thrissa* of Linnæus.

Opisthonema Gill, 1863, based on *thrissa* of Lacépède = *oglinus* of Le Sueur.

Konosirus Jordan & Snyder, 1900, based on *punctatus* Schlegel, which is a congener of *Clupea thrissa* Linnæus (= *Clupea nasus* Bloch) and not of *Clupanodon thrissa* Lacépède, which is *oglinus* of Le Sueur. Most writers unite *Konosirus* with *Dorosoma* Rafinesque, 1829; but the two are probably distinct.

2. *nasicus*. This is the original *thrissa* of Le Sueur and is congeneric with *Konosirus punctatus*.

3. *pilchardus*. This has never been made type of a genus. It is certainly congeneric with *Sardinia* Poey, 1870, with *Amblygaster* Bleeker, 1855, and I now think with *Sardinella* Valenciennes, 1845. Most writers (wrongly I think) unite all these with *Clupea* Linnæus, 1758.

4. *sinensis*. This is referred by Valenciennes to *Clupeonia* Valenciennes, 1845; which genus is probably identical with *Harengula* Valenciennes, 1845, earlier page. Most writers (I think wrongly) place it in *Clupea*.

5. *africanus*. This is congeneric with the type of *Ilisha* Gray, 1836, and with that of *Pellona* Valenciennes, 1845. It has never been taken as type of a genus.

6. *jussieu*. Type of *Clupeonia* Valenciennes, 1845, apparently congeneric with types of *Harengula* and *Kowala* of the same author on earlier pages. Usually referred to *Clupea*.

By the first 'reviser' after Lacépède, Rafinesque, 1815, *Thrissa* is substituted for *Clupanodon*, and Lacépède's *thrissa* is doubtless to be taken as Rafinesque's type. By the next, Buchanan, 1822, *ilisha* (= *sinensis* Lac.) is described as a new species of *Clupanodon*. The genus *Clupanodon* then dropped out of notice until revived by Dr. Jordan in 1882, by a process of elimination for *Clupeonia jussieu*. Later the same writer, by another process of elimination, substituted *Clupanodon* for *Sardinia*. Still later, by the same process with further light, the newly defined genus *Konosirus*, being congeneric with *Clupanodon*

nasicus, was suppressed in favor of *Clupanodon*. The change of result depends on the status assigned to *Konosirus*, *Sardinia* and *Clupeonia*. By the process of elimination the name *Clupanodon* can be used for any one of several species, its use depending on the views one may hold of these closely related generic or subgeneric types. If restricted to the *chef de file*, the matter is at once settled. The species involved become:

Clupanodon oglinus.
Konosirus thrissa.
Sardinella pilchardus.
Harengula ilisha.
Ilisha africana.
Harengula jussieu.

The rule of the first reviser, if the rule of the *chef de file* be disregarded, would cause *Clupanodon* to replace *Harengula*, *Clupeonia* and *Kowala*, *jussieu* being its type.

Another illustration is taken from the genus of flounders, *Pleuronectes* Linnæus, 1758.

In this genus, the European species mentioned by Linnæus and by Artedi, from whom the genus is derived, are:

hippoglossus (type of *Hippoglossus* Cuvier, 1817).
platessa (type of *Platessa* Cuvier, 1817).
flesus (type of *Flesus* Moreau, 1873, a genus very close to *Platessa*, perhaps, in fact, identical).
limanda (type of *Limanda* Gottsche, 1835).
solea (type of *Solea* Quensel, 1803, of *Solea* Rafinesque, 1810, and of *Solea* Cuvier, 1817).
rhombus (type of *Rhombus* Cuvier, 1817, name preoccupied: of *Rhomboides* Goldfusz, 1820, substitute name; also, as *Bothus rumolo*, the first species named under *Bothus* Rafinesque, 1810).
maximus (type of *Psetta* Swainson, 1839, not *Psettus* Cuvier, 1817; first species named of *Scophthalmus* Rafinesque, 1810, which includes also *rhombus*).
passer (a synonym of *flesus*).

Scophthalmus and *Bothus* are based on three species each, the two categories being essentially the same, *Scophthalmus* being based on literature, *Bothus* on specimens. But the order is changed in the two cases, *maximus* occurring first under *Scophthalmus*,

rumolo (*rhombus*) under *Bothus*. Under *Rhombus* and *Bothus* and *Scophthalmus*, both *maximus* and *rhombus* are included, and *Psetta*, although based on *maximus* alone, by implication is a substitute for *Rhombus*.

The first reviser, Rafinesque, 1810, leaves no species in *Pleuronectes*, unless, as he refers all the other species to other genera, we might regard *hippoglossus*, which is not mentioned by him as the type of his *Pleuronectes*. The next reviser, Cuvier, 1817, recognizes the genus, *Pleuronectes* as used by Linnæus, but at once separates it into four genera or subgenera dropping the original name. These are *Platessa* (*platessa*, *flesus*, *limanda*), *Hippoglossus* (*hippoglossus*), *Rhombus* (*maximus*, *rhombus*) and *Solea* (*solea*). Meanwhile *Solea* had been set off previously by Quensel (1803) and by Rafinesque (1810), the latter author very erroneously referring to it, *platessa*, *flesus* and *limanda* also. Swainson, 1839, the next reviser, recognizes *Pleuronectes* (*platessa*), *Hippoglossus* (*hippoglossus*), *Psetta* (*maximus*) and *Solea* (*solea*). This is the first restricted use of *Pleuronectes* since the time of Linnæus and his followers. Later *Pleuronectes* was restricted by me to *maximus* by the rule of elimination, *flesus* being then regarded, as it is still regarded by most authors, as congeneric with *platessa*. *Limanda* is also near *platessa*. But neither *limanda* nor *flesus* is the 'best known European species' of the Linnæan genus *Pleuronectes*. The rule of the first reviser would fix *Pleuronectes* with *platessa*, the rule of the best known species with *platessa* or *maximus*, the rule of elimination would place *flesus* as type of *Pleuronectes*, if defined as dealing with a species at a time. But Rafinesque took out *solea*, *platessa* and *flesus* together, to form his genus *Solea*, leaving only *hippoglossus* not provided for. This fact, some would hold, restricts *Pleuronectes* to *P. hippoglossus*. Cuvier next took out all the species, leaving no genus *Pleuronectes*, and placing *Rhombus* last, next to *Solea*. On the other hand, *platessa* was placed first by Cuvier, its subgenus *Platessa* being apparently the *chef de file* subgenus in Cuvier's genus *Pleuronectes*.

With this group nothing in particular can

be settled by the process of elimination unless we agree beforehand as to whether *Flesus* is a valid genus, or as to what were the unexpressed purposes of Rafinesque.

But common usage and common sense agree in placing *platessa*, the common Plaice, as the type of *Pleuronectes*.

DAVID STARR JORDAN.

AN INTERESTING CRETACEOUS CHIMÆROID
EGG-CASE.

ALMOST nothing is known of the structural characteristics of the holocephalous fishes of the Mesozoic period except dental plates or teeth. The remains of such, however, are numerous and about a score of generic names have been proposed for them, although A. Smith Woodward only fully recognizes five, *Ganodus*, *Ischyodus*, *Edaphodon*, *Callorhynchus* and *Elasmodectes*. I was, therefore, much interested in a fossil which Drs. Frank H. Knowlton and T. W. Stanton referred to me for identification, if possible, and which I at once recognized as a chimæroid ovicapsule apparently most nearly resembling that of modern deep-sea forms.

The interest arises from the assumption that where likeness prevails between such products, not only the parts which frame them but other structures must correspond. The inference is not irrefragable, but in the absence of contradictory data, perfectly legitimate as a provisional hypothesis at least.

The fossilized egg-cases previously known are few and the indications as to affinities interesting as well as important. Three figures have been published of Jurassic egg-cases, two by Emil Bessels and one by Otto Jaekel. All are of the *Callorhynchus* type and it is significant that a 'right palatine tooth,' obtained from the 'Lower Greensand' of New Zealand, has been attributed by E. T. Newton and Woodward to that genus and named *Callorhynchus hectori*.

The newly found fossil was obtained by Mr. N. H. Darton, of the U. S. Geological Survey, from 'massive sandstone' a few miles west of Laramie, Wyoming.

The contour and general form are well preserved but not the details. The resemblance

to the ovicapsules of *Harriotta* and *Rhinochimæra* lies in the absence of differentiation between the anterior and posterior portions of the lateral alæ of the capsule and the uniformity of the transverse costal ridges all through. It differs from the ovicapsules of both *Harriotta* and *Rhinochimæra* by the greater width of the alæ and especially the greater width and extension forward along the sides of the archidome.¹ The resemblance is greatest to *Rhinochimæra*.

The genus *Harriotta* was set apart as the type of a subfamily (Harriottinæ) by Gill, in 1896, and it was associated with *Rhinochimæra* in a family (Rhinochimæridæ) by Garman, in 1904. It is to this group (if a family, properly nameable Harriottidæ) that the Wyoming fossil belongs. It can not be correlated with any one of the many generic names (*Eumylodus*, *Mylognathus*, *Dipristis*, *Sphagepœa*, *Diphrissa*, *Bryactinus*, *Isotania* and *Leptomylus*) that have been especially coined for American Cretaceous fossils, but the naming of it, if such must be done, I leave to Dr. Dean who is now publishing (through the Carnegie Institution) an elaborate work on the chimæroids. I have had the privilege of looking over the proof-sheets of that work and my knowledge of the ovicapsules of the Harriottidæ is chiefly derived from it, though I had long ago seen those of *Harriotta*.

If these determinations prove correct and the groups named families by Garman are accepted as such the curious deduction follows that no fossil ovicapsule of a typical chimærid has been found as yet.

Although the living harriottids are deep-sea forms, it does not follow that a deep sea is indicated for the habitat of the extinct harriottid. The character of the sandstone as well as of the basin in which the ovicapsule was found is opposed to the hypothesis of a deep sea. It must be remembered, too, that the same genus may have species ranging from shallow water to abyssal depths; *Chimæra*, for example, has a species (*C. collieri*) which may be caught from a city wharf and

¹In the interest of conciseness of description I would use *archidome* for the chamber for the head and trunk of the chimæroid and *urodome* for that receiving the caudal portion.